DOCUMENT RESUME

ED 408 989 IR 018 402

AUTHOR Clark, Barbara I.; Knupfer, Nancy Nelson
TITLE Hypermedia as a Distinct Medium: Challenges for Designers.
PUB DATE Jan 97
NOTE 10p.; In: VisionQuest: Journeys toward Visual Literacy. Selected Readings from the Annual Conference of the International Visual Literacy Association (28th, Cheyenne, Wyoming, October, 1996); see IR 018 353.
PUB TYPE Guides - Non-Classroom (055) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Audiovisual Aids; *Computer Software Development; *Design Requirements; Educational Technology; Evaluation Criteria; Guidelines; *Hypermedia; *Instructional Design; *Instructional Materials; *Multimedia Materials; Online Systems
IDENTIFIERS Conceptual Frameworks; Visual Imagery

ABSTRACT

As multimedia development software becomes easier to use and more powerful, instructional designers can establish ways of incorporating the Internet into their lessons. This paper introduces some questions that should be considered prior to stepping into that next level of instructional design. Specifically the paper addresses some of the challenges and dilemmas faced by two instructional designers as they incorporated visual imagery and audio components into the design of two distinct interactive multimedia products. Each product was designed as a professional development seminar, or series of seminars, for preservice teachers and for practicing social workers. The two multimedia products contain visual text, still images, still and animated graphics, sound, and full-motion video vignettes contained on a laser videodisc or CD-ROM. Both design teams followed some common theoretical elements of interactive system design, yet both broke new ground in developing a product best suited to their given audience and instructional needs. Success of any product's effectiveness is affected by the learners' acceptance or attitude toward the product, the product's match with learners' technical and content needs and the product's ability to be used within a given environment. Suggestions for developing a framework to guide future instructional designs are provided according to the following: (1) how to structure the visual elements; (2) proper uses of visual metaphors; (3) formidable questions inherent in the presentation of the images; (4) when design should supersede content; (5) the importance of the designer's familiarity with new models of instruction and learning theory; (6) theoretical elements appropriate for the graphical user interface; (7) assuring that the images, language, and content accurately represent the cultural and gender variables; (8) how to evaluate visual elements; and (9) how formative and summative evaluation should occur. (AEF)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 408 989

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Hypermedia as a Distinct Medium: Challenges for Designers

Barbara I. Clark and Nancy Nelson Knupfer

Abstract

As multimedia development software becomes easier to use and more powerful, instructional designers can begin to think about ways of incorporating the Internet into their lessons. This paper introduces some questions that should be considered prior to stepping into that next level of instructional design.

Each year brings new enhancements to hypermediated software and instructional designers must therefore face new challenges as they apply the software in practice. Product enhancements provide authoring software with increased capabilities for designing and producing multimediated instruction. These enhancements permit new possibilities for the appearance and functionality of courseware, and thus pose new challenges for instructional designers.

Further, the increasing ease with which the improved authoring software can potentially be used, could lead to a situation in which people produce instructional courseware without the aid or advice of instructional designers. Products that result, whether stand-alone desktop systems or those that incorporate other resources such as material from the world wide web, have vast potential. Yet the new technological enhancements will not necessarily be applied in a way that truly improves the instruction.

Technology enhancements offer fancy features that can make the instruction seem "eye-catching" and special. These "bells and whistles" seem to have great potential but often take the lead and interfere with instructional design. Indeed, if misapplied, the software enhancements could actually befuddle the learning process.

A framework is needed to provide guidance for people who must produce instructionally sound products that utilize a mix of stagnant text, text as a dynamic visual image, still and motion visual images, and audio within a hypermediated format. Such a framework can provide the necessary guidance to make wise use of the new enhancements to the technology.

Links and connections can take on different dimensions. The processes of linking visual images with visual text, and making connections between realia and the meaning of the images in a hypermediated format, lead to questions about effective instructional design of courseware that incorporates those processes. Moreover, those processes cause software evaluators to rethink the standard for effective and appropriate presentations.

This paper addresses some of the challenges and dilemmas faced by two instructional designers as they incorporated visual imagery and audio components into the design of two distinct interactive multimedia products. Each instructional product was designed as a professional development seminar, or series of instructional seminars, for two distinctly different groups of adult learners. One product was designed for preservice teachers who spend a significant amount of time on campus and in classes, while the other was designed for practicing social workers who are employed in isolated, rural areas where access to professional development is extremely limited.

The two multimedia products present content-specific information pertinent to teachers and social workers. The learners use visual text, still images, still and animated graphics, sound, and full-motion video vignettes contained on a laser videodisc or CD-ROM. The two programs provide learners with new information, observational examples, and interactive practice about content specific to their fields of teaching or social work. There are many similarities between the instructional needs of the two groups of learners, as well as the products' capabilities. Therefore many design aspects are common to both, however the user interfaces between the two programs are very different.

Because it is quite extensive in scope, the social worker's program is being developed as a series of ten separate modules with similar functionality. It is designed to accommodate people who have very limited computer skills. It uses such traditional design elements as text-based menus, buttons, pop-up text boxes, concept maps, and the choice of receiving audio-based,

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Alice D. Walker
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

IR018403

BEST COPY AVAILABLE

text-based, or a combination of audio and text within the instructional interface (see Figure 1).

The teacher's program uses a graphical user interface (GUI) that portrays familiar objects that can be found in traditional school environments. For example, one menu depicts a hallway, classroom doors, books, and chalkboards for the learner to choose among. Another menu depicts an advisor's desk with the topics of advisement hung on a bulletin board display behind the desk. The learner can access information by selecting a topic within the graphic (see Figure 2). This program also contains an electronic notebook in which the learners can write their questions and reactions to their observations. Both programs are hypermediated, employ video vignettes, and contain a presentation component, an application component, and an assessment component.

Both product design teams were able to follow some common theoretical elements of interactive system design, yet both broke new ground in their own way as they strove to create a product best suited to their given audience and instructional needs. Formative evaluation was conducted on both programs (Clark, 1995; Knupfer, Barrett, & Lee, 1995). In addition, summative evaluation was conducted on the product designed for teachers (Clark, 1995). Results of the summative evaluation of the teacher's multimedia product indicate that significant differences occurred in the abilities of teachers who used this program to identify, understand, and explain specific teaching strategies they observed in the video vignettes as compared to those who did not use the multimedia.

The product designed for social workers is much more extensive; it represents a series of ten distinct topics of study that each carry three continuing education units of credit for social workers who complete the training. Each topic is considered as a separate course of study and is contained in a separate, but coordinated module. Although the ten modules are designed as a set of training for social workers, the modules can be studied in any order and in any amount. The criteria for receiving credit for each module rests in completion of an on-line test with a passing grade. The modules are being phased into numerous communities as the development progresses and eventually all ten modules will be in place. As each module of the social work series is developed, it goes through formative evaluation and field testing. Summative evaluation will be conducted after several modules have been placed into the social work offices in various communities.

Success of any product's effectiveness will be affected by the learners' acceptance or attitude toward the product, the product's match with learners' needs both in a technical sense and in terms of content, and the product's ability to be used within a given environment. Therefore, any evaluation must also consider the reactions of both the social workers and preservice teachers to using the hypermedia. Results of the evaluations to date suggest some guidelines that instructional designers should consider when designing such products. Further, as we think about ways to improve those products and enhance their content and functionality with material from outside sources, such as those from the Internet, we need to be able to evaluate the quality of the outside resources as well.

Interactive multimedia computer tools can expand our ways of thinking and perhaps encourage metacognition, more deeply than software that contains only standard text, few images, or non-interactive video. In interactive multimedia contexts, learners browse and search through video, images and text; form interpretive thoughts; make connections between visual text, still images, and full-motion video images; and cluster discrete fragments of information into meaningful ideas. The challenge for instructional designers is to take the set of guidelines that has been developed for interactive, computer-based instruction, and extend them to include guidelines that consider the dynamic nature of the myriad possibilities that become available with new technological tools, resources, and techniques.

As authoring tools become more transparent in functionality and more people become skilled at incorporating the Internet into their work, the volume of interactive, multimediated software intended for self instruction is likely to increase. This increase signals two things: more software that is produced by novice instructional designers or people who have limited knowledge of techniques appropriate to efficient learning, and the need for guidelines to use in the production

Figure 1
Social Workers' Project Sample with Icon and Text User Interface

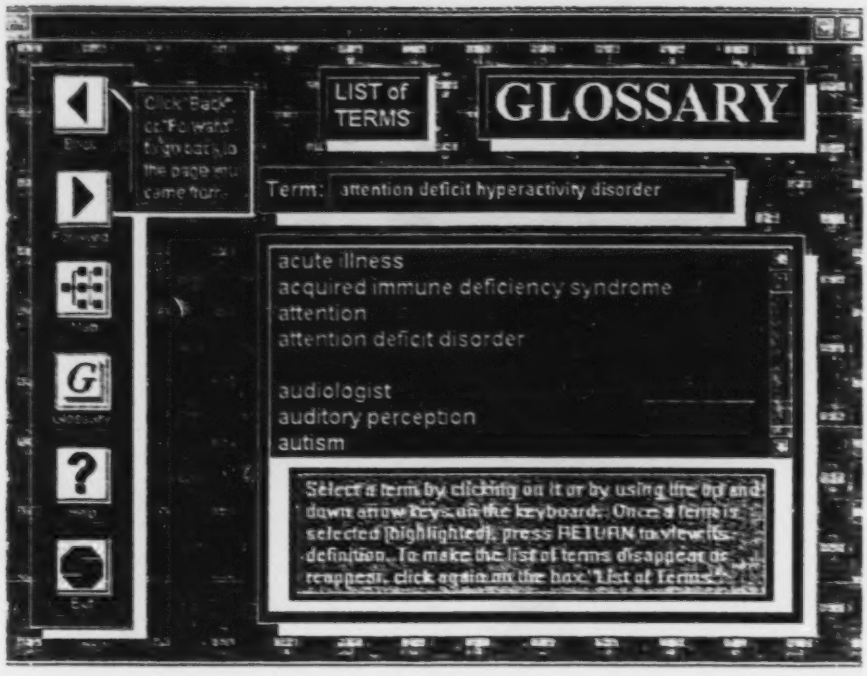
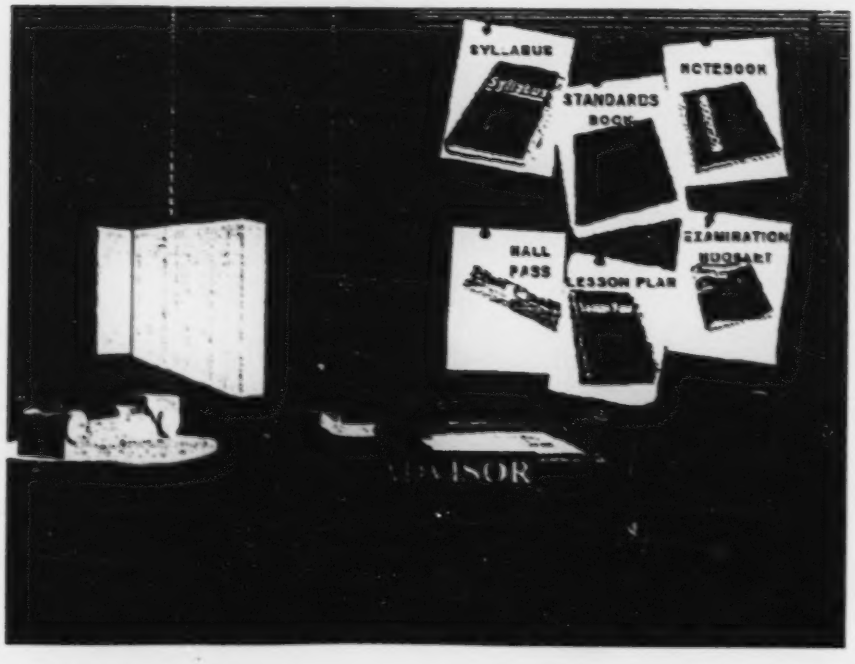


Figure 2
Teachers' Project Sample with Graphical User Interface



BEST COPY AVAILABLE

BEST COPY AVAILABLE

and evaluation of the hypermediated software. Such a framework will go beyond the guidelines used for computer-based instruction as we knew it a few years ago and if not able to provide succinct answers, will need to at least address additional areas of possibilities.

In the past, Knupfer (1995) has suggested guidelines for visual imagery within computer-based local and distance instruction that incorporate some of the well-established standards for instructional television production. Now, we must take that set of guidelines and extend it even further. In doing so, the following questions seem essential to any improvement of instructional design guidelines for interactive multimedia. Their answers help to develop a possible framework to guide future instructional designs for hypermediated learning:

- How should the visual elements of hypermedia be structured?
- What are the proper uses of visual metaphors?
- What are the formidable questions inherent in the presentation of the images? (e.g. text links per screen, images per screen, length of video vignettes)
- When does design supersede content?
- What is the importance of the instructional designer's familiarity with new models of instruction and learning theory?
- What theoretical elements are appropriate for the graphical-user interface:
- Are the images, language, and content free of cultural and gender bias?
- How do the images, language, and content accurately represent the cultural and gender variables?
- How should the visual elements be evaluated?
- How should formative and summative evaluation occur?

Although there are no answers that will work in all situations, for all audiences, there are some considerations that designers can incorporate into the planning process. As hypermedia takes fuller advantage of on-line resources it will be important for designers to consider strategies for handling dynamic information and images from outside resources, such as the Internet or World Wide Web (WWW). These outside resources can be essential to maintaining current information within the lessons. For example, a designer might link a lesson to a specific Internet site or database and display that information within the lesson screen. The thought of maintaining the integrity of a current multimedia lesson while incorporating information from the Internet could be daunting. Therefore, the following thoughts should be helpful when considering each question.

How should the visual elements of hypermedia be structured?

Visual imagery is one of the most important elements of hypermediated instruction, yet many designers fail to incorporate it to it fullest potential. If used wisely the visuals can greatly enhance the instructional message. Like other elements within the product design, visual information needs to be applied in a consistent manner yet with attention to a comfortable blend of variety and aesthetics. Both of the products evaluated for this study did an excellent job of applying visual elements to a certain extent, and both have areas in which they can be improved.

The greatest weakness of both products stemmed from the limited experience of certain key decision makers who lacked enough skill to visualize elements of the learning process. Having not been trained in instructional design, nor visual learning, nor graphic design, nor aesthetics of art and so on, some key leaders were greatly limited in their ability to imagine the potential of the visual messages within each product.

Certain weaknesses within each product, both in terms of adding time to the production and in the final visual message, were the direct result of decisions made by project leaders who did not understand how to take advantage of the medium to enhance learning, tried to save time by skipping steps in the design phase, and placed too much responsibility on programmers to provide design solutions toward the end of the development cycle. The complexity of reasons for these weaknesses are beyond the scope of this paper, but the resulting compromise in potential learning is most evident in certain mismatches between video imagery or graphics and the content or tone of the script.

There is no doubt that the single most important factor in the successful design and imagery used was the result of

teamwork that drew on the talents of a variety of people. Communication among the design team was essential. Successful visualization within each of the products was the direct result of being able to work with a talented artist who was able to shape the ideas into visual form that carried meaning into the instructional process.

The visual elements that seem most important are those that comprise the basic structure of the image, add meaning to the message, and employ the power of visual impact when appropriate (Knupfer, 1994).

The structure of the image first considers the visual as a whole, then its components and the elements of good screen design. In order for the various image components to work together, elements of well-planned screen design must weave the components together in an aesthetically pleasing and understandable format. Thus, one must consider both the separate image components and the screen design.

Information becomes valuable as it takes on meaning for an individual. Since visuals are meant to aid in the discovery of meaning, it follows that well-designed visuals will help students interpret the meaning. Computer images vary widely in potential design and usage. Images can be static or dynamic, concrete or abstract, and they can change as a result of user interaction with the program. A learner's interpretation of the image can be affected by the text, type of graphic, and layout employed.

Computer graphics and appropriate screen displays lend power to communications by adding an image to the text. Visual images can aid message interpretation and enhance learning. They can also add power to the message by providing an emotional element that is beyond that of other communication strategies. Realism can be enhanced by providing a graphic component. Images can represent realistic data ranging from simple sketches or graphs to intricate displays or vividly emotional scenes. Virtual reality can even conjure up imaginary situations through artificial imagery.

Because computers display images from peripheral devices, it is possible to display still or dynamic photos of real events. These events and their results can combine with text and audio segments to provide a sense of realism to the user that otherwise would not be possible. For example, the ABC News videodisc provides real news footage that goes beyond newsroom reporting to provide visual displays of field events. Along with the understanding provided by the realism of these events, comes the potential to stir emotions for various reasons.

What are the proper uses of visual metaphors?

Metaphors are only as good as a situation allows. Metaphors can work well in a variety of situations, but in all cases must provide an appropriate match between the topic, the learners, and the way the metaphor is applied to the design. If learners cannot relate to the metaphor, then the instructional message will be lost. But if they can relate to the metaphor, then the instructional message can be enhanced.

Metaphors are used to some degree in both the social work and the teaching multimedia projects, but they are applied with differing intensities. The social work project incorporates a variety of limited metaphors into the modules, but does not place heavy emphasis on them. Further, it does not carry any one, single metaphor throughout the entire series other than in the overall functionality of the user interface. For example, the legal module was developed by different design team members and contains different metaphors than the stress module, yet the general functionality of the user interface remains consistent.

The metaphor within the teacher multimedia worked well with the student teachers for whom it was intended, but other learning audiences have reacted with confusion and frustration. Objections to the completely graphic interface arose because some learners could not relate to the school scenario, needed more preliminary interpretation of the graphical user interface, or preferred environments that were more text-based. General comments about desiring more text indicated some potential for confusion with interpreting the school metaphor as well as unclear functionality of each graphic. Learner who are willing to explore will probably feel more comfortable in this type of environment.

What are the formidable questions inherent in the presentation of the images?

The number of text links per screen can become quite dense, depending upon the situation at hand. If the user interface

BEST COPY AVAILABLE

clearly creates a path for learners to follow that allows them to explore certain branches of information in depth, then designers need to weight the consequences of finding more information versus the potential of missing important points by being distracted. The number of links per screen certainly will depend upon the purpose of the instruction and the audience involved.

The balance of images per screen will not be determined by a precise definition, but will depend upon the purpose of the imagery, the balance of the screen design, and the functionality of the images. It is perhaps better to design one complex but integrated set of images as opposed to independent, cluttered, or conflicting images. In addition, the meaning of the images is important. All images should fulfill a specific purpose. That purpose might be to get attention, to enhance meaning, to add variety, and so on, but it clearly should not be simply to fill a blank space on the screen.

The length of the video vignettes was a topic of debate with both of the projects at hand. While the vignettes needed to be long enough to provide meaningful scenarios that portrayed information clearly, they need to be short enough to allow user interaction, practice, and feedback at appropriate places. Large amounts of video information can be incorporated as smaller video clips as long as there is a common thread that laces the information together.

When does design supersede content?

Some people might say *never*, but there are times when the design needs to supersede content. Courseware must show consistency within the user interface, so once a design standard is decided upon it must be maintained in a similar manner throughout the instruction. In addition, designers need to be aware of standards and common practices that have been incorporated into other software that the learners have used in the past. If learners expect the software to function in specific ways, then it is best to incorporate standard practices when possible so that learners can concentrate on the learning and not be confused by inconsistencies of functionality.

In a case where the instruction is designed as a series of modules, learners expect one module to function in a similar manner as another. Like a series of books in a set, learners expect certain consistencies within the look, feel, tone, instructional approach, and functionality of the courseware.

When content can be delivered in a variety of ways, design can determine final decisions about how content is delivered and how much detail is appropriate. Because hypertext allows hot links to be made, designers are not pressed to include all details about a subject within the main part of the courseware, but can use links to outside resources as necessary, thus enabling learners to choose more or less detail, depending on how much information they need about specific topics and how much time they can spend at the given moment.

Screen design enters into consideration as well. Good screen design allows adequate white space so that the eye has a resting place and incorporates imagery in a meaningful way. Rather than filling the screen with text, designers often need to reword and abbreviate text so that it fits well within the visual design of the screen and in so doing, need to consider grouping of words, phrases, and lists in the best way to enhance the mental processes. Substituting imagery for text can add power to the message.

What is the importance of the instructional designer's familiarity with new models of instruction and learning theory?

Design team members debated about whether the same instructional approach could be used for everyone who will use the courseware., If not, then how could the designers accommodated different learning styles within the courseware?

Like other types of instruction, hypermediated instruction can provide examples, practice exercises, and feedback that will use a variety of instructional styles and appeal to different styles of learning. As hypermedia becomes more sophisticated and gains capability of incorporating outside resources, designers can leave more discretion to user preferences.

Meanwhile, designers can do such things as provide more choices within the use interface. Those choices could allow learners to move in different paths through the material and incorporate more or less information into the lesson as needed. In

addition, learners should not be forced to listen to audio or to read text verbatim at all times, but should be allowed choices to hear, read, or hear while reading text in specific situations within the learning. Thus learners can choose to receive information in a way that is most comfortable at a given time.

It will be important that designers break free of behaviorist models to the extent that the courseware does not rely completely on that approach. Hypermedia allows a much more creative approach to instruction than the drill and practice style of learning, so designers can incorporate more constructivist approaches to courseware design as desired and likewise employ behaviorism, guided learning, and on as appropriate.

What theoretical elements are appropriate for the graphical-user interface?

- Are situated-learning metaphors appropriate to the audience and the content? If so, what situations are suggested or accommodated?

- How is learning constructed? What design elements related to learning theory are evident within the courseware? Is there evidence of learner control and autonomy, or is the program designed in a more behavioristic, directed structure?

- Guided learning? What evidence is there of motivating learners and attending to various learning theories? Is learning guided in a systematic way, a tightly controlled way, not at all, or something in between? Does there seem to be a match between the courseware's purpose, the audience, skill level, and instructional approach? How does the system work together as a whole?

Are the images, language, and content free of cultural and gender bias?

Media often portrays people in stereotypical roles. Movies, television programs, advertising, books, and now even clip art are fraught with stereotypes based upon cultural background, race, and gender. As courseware developers think about designing, scanning, or downloading images into the courseware, they should consider what messages are implied by the images.

Are the men portrayed in leadership positions, while the women appear in subordinate roles? Are men portrayed in work situations or using technology, while women are portrayed in nurturing roles? Are women portrayed as either older and overly-grandmotherly, or young and overly-sexy?

Are colors and tone used to add feeling or draw attention to an image in a suggestive way that might bias the learners? Examples of this are the darkening of O. J. Simpson's face on the cover of Time magazine (1994) and the bright red coloration applied to the woman figure's nipples in an otherwise dark and muted image depicting a male and female within a recent New York Times (1996) report on cancer? The former suggests a guilty verdict prior to the trial while the latter continues the American male fixation on women's breasts as sexual objects, even within an article focused on medical education.

Do sports analogies or competition appeal more to males than females. Are cultural groups represented in true proportions and in accurate situations with the examples, imagery, and prerequisite knowledge necessary for successful completion?

How do the images, language, and content accurately represent the cultural and gender variables?

This question goes deeper into the underlying messages portrayed through the images, language, and content. Rather than simply avoiding stereotypes, it is important to keep the messages in proper context in terms of culture and gender. For example, does the design go the extra step to consider and include examples from the cultural group that the courseware will be used with? Certain examples will make better sense if the learners can relate to them.

Messages intended to influence attitudes toward using birth control and planned parenting, need to consider the cultural underpinnings of such issues as within the learning group. In cultures where a people's status is influenced by the number or gender of their of children, any attempt to curb birth rates would need a very sensitive approach. Likewise, portraying value systems of rural American within

BEST COPY AVAILABLE

inner city schools and vice versa, could make the instruction fall flat.

Icons and symbology can be problematic. While some icons and symbols are interpreted with similar meanings, others will take on different meanings within different international audiences. A dragon, for example, is thought of as a scary and evil presence in Western culture, while it is believed to be powerful and even protective in Eastern cultures.

How should the visual elements be evaluated?

Imagery created with computers can be simple or complex and it can be altered within the computer environment so that the basic visual elements such as line, space, shape, form, texture, color and so on can take on different characteristics than within other media. There are a host of questions that must be asked about how imagery is used within hypermedia..

For example, what type of look and feel should be used in hyper-mediated learning environments? How can the imagery enhance or detract form the learning process? Are there certain ways to display information that work better in hypermedia than in other media? If so, how should designers modify images to best present them on the computer?

How much contrast is just enough, but not too much, to make the image legible and achieve the necessary effect? Can the same guidelines be followed as for projected images or broadcast images? If not, what are the differences and why are those differences important? If the images will be drawn from different sources into the hypermedia, are there any standards that one should look for in order to provide pleasing and meaningful images for the learners?

Is the imagery appropriate to content? Are visual images linked logically with other images and text? If the images change, do they do so with any consistency or real purpose? How are images positioned within the user interface? The specific situation in which the media will be used will determine the final answers to most of these questions. The age and sophistication of the learner, the likelihood of drawing from mixed sources, the technical capabilities of the equipment, and the topic at hand will certainly all affect the answers to these questions.

How should formative and summative evaluation occur?

- What questions regarding visually literate learners are appropriate in formative and summative evaluations:
  - learner understanding of the importance of the image or video to the content?
  - learner ability to "read" the image or video in context with the text and other elements in the GUI?
  - acceptance level and comfort with the GUI?

As the technology becomes more sophisticated, it will be possible to incorporate images and text form the World Wide Web into our classes. It will be important to use knowledge gained from experience as well as the answers to some of these formidable questions as we develop computer-based or multimediated instruction that seeks innovative uses of the Internet.

References

Clark, B. I. (1995). *Understanding teaching: An interactive multimeida professional development observational tool for teachers.* Unpublished dissertation completed at Arizona State University, Tempe, AZ.

Knupfer, N. N. (1994). Computers and visual learning. In D. M. Moore & F. M. Dwyer (Ed.), *Visual literacy: A spectrum of learning* (pp. 209-234). Englewood Cliffs, NJ: Educational Technology Publications.

Knupfer, N. N. (1995). Developing hypermediated, videodisc training for child welfare personnel: Bringing visually rich training to rural areas. In D. G. Beauchamp, R. A. Braden, & R. E. Griffin (Eds.) *Imagery and visual literacy* (pp. 351-363). Corsicana, TX: The International Visual Literacy Association.

Knupfer, N. N., Barrett, D. & Lee, O. H. (1995). A collaborative multimedia development project for rural training: Results of a beta test and adjustments to design. In M. R. Simonson & M. Anderson (Eds.) *Proceedings of selected research and development presentations the 1995 national convention of the Association of Educational Communications and Technology (AECT)*

at Anaheim, CA, February. Ames, IA: Research and Theory Division, AECT.

New York Times (1995, Jan). *New York Times, Sunday Magazine*. Cover.

Time (1994, Sept.). *Time* magazine. Cover.